

Claims

1. A robot apparatus comprising:

memory means for storing behavioral models; and
action generating means for generating action by the use of
partial or full state space of said behavioral model, and wherein
said action generating means changes said state space to be
used for said action generation, of said behavioral models while
expanding or reducing said state space.
2. The robot apparatus according to Claim 1, wherein:

said behavioral models consists of probability state
transition models; and
said action generating means changes said transition
probability to a transition-prohibited state, to a predetermined
value higher than 0, by setting said transition probability of
said behavioral models to 0, thereby said state space to be used
for said action generation of said behavioral models is expanded.
3. The robot apparatus according to Claim 1, wherein:

said behavioral model consists of probability state
transition models; and
said action generating means sets transition probability to a
target state to 0 to thereby reduce said state space to be used
for said action generation of said behavioral models.

4. The robot apparatus according to Claim 1, having growth models which grow stepwise, and wherein said action generating means changes state space to be used for said action generation of said behavioral models in accordance with said growth of said growth models while expanding or reducing it.

5. A robot apparatus, having behavioral models comprising state transition models and for generating action on the basis of said behavioral model, wherein:

in said behavioral model, transition to a predetermined node is described as transition to a virtual node consisting of imaginary nodes, and a predetermined node group is allocated to said virtual node, and

changing means for changing said node group to be allocated to said virtual node is provided.

6. The robot apparatus according to Claim 5, having growth models which grow stepwise, and wherein said changing means changes said node group to be allocated to said virtual node, in accordance with said growth of said growth models.

7. A control method for a robot apparatus, having behavioral models, and for generating action on the basis of said behavioral model, comprising:

 a first step of generating said action by the use of partial or full state space of said behavioral model; and

 a second step of changing said state space to be used for said action generation, of said behavioral models while expanding or reducing said state space.

8. The control method for a robot apparatus according to Claim 7, wherein:

 said behavioral models comprise probability state transition models; and

 in said second step, by setting transition probability of said behavioral models to 0, said transition probability to a transition-prohibited state is changed to a predetermined value higher than 0, thereby said state space to be used for said action generation of said behavioral models is be expanded.

9. The control method for a robot apparatus according to Claim 7, wherein:

 said behavioral models comprises probability state transition models; and

in said second step, transition probability to a target state is set to 0 to thereby reduce said state space to be used for said action generation of said behavioral models.

10. The control method for a robot apparatus according to Claim 7, wherein:

 said robot apparatus has growth models which grow stepwise;
and

 in said second step, state space to be used for said action generation of said behavioral models is changed in accordance with said growth of said growth models while expanding or reducing it.

11. A control method for a robot apparatus, having behavioral models comprising state transition models, and for generating action on the basis of said behavioral models, comprising:

 a first step of describing transition to a predetermined node in said behavioral models as transition to a virtual node consisting of imaginary nodes, and allocating a predetermined node group to said virtual node; and

 a second step of changing said node group to be allocated to said virtual node.

12. The control method for a robot apparatus according to Claim 11, wherein:

13. said robot apparatus has growth models which grow stepwise; and

in said second step, said node group to be allocated to said virtual node is changed in accordance with said growth of said growth models.

13. A robot apparatus having emotion models consisting of a plurality of emotional behaviors and instinct models consisting of a plurality of desires, for generating action on the basis of the parameter value of each emotional behavior of the emotion model and/or the parameter value of each desire of the instinct model which are sequentially updated in accordance with prescribed conditions, comprising

restricting means for restricting the number of the emotional behaviors or the desires used for generating the action so as to increase or decrease stepwise.

14. The robot apparatus according to claim 13, wherein said restricting means increases and/or decreases stepwise the number of the emotional behaviors or the desires used for generating the action on the basis of the accumulation of prescribed stimulation which are externally applied and/or the lapse of time.

15. The robot apparatus according to claim 13, comprising:

action generating means for generating the action on the basis of each of the parameter values of the emotional behaviors and/or the desires and a prescribed behavioral model; and

behavioral model changing means for changing the behavioral model in the action generating means, to a behavioral model whose growth level is higher than that of the former, on the basis of the accumulation of prescribed stimulation which are externally applied and/or the lapse of time, and wherein

said restricting means increases or decreases the number of the emotional behaviors and/or the desires used for generating the action depending on the change of the behavioral model by the behavioral model changing means.

16. The robot apparatus according to claim 13, wherein

said emotion models include six emotional behaviors of joy, sadness, anger, surprise, disgust and fear as said emotional behaviors.

17. The robot apparatus according to claim 13, wherein

said instinct models include four desires of exercise, affection, appetite and curiosity as said desires.

18. The robot apparatus according to claim 13, further comprising:

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emotional behavior and/or desire updating means for sequentially updating the parameter value of each emotional behavior and/or the parameter value of each desire, depending on corresponding sensitivity individually set to each emotional behavior and/or each desire, on the basis of the stimulation and/or the lapse of time; and

sensitivity updating means for evaluating an environment and respectively updating the sensitivity corresponding to each emotional behavior and/or each desire on the basis of the evaluated result.

19. A robot apparatus having emotion models consisting of a plurality of emotional behaviors and instinct models consisting of a plurality of desires, for generating action on the basis of the parameter value of each emotional behavior of the emotion model and/or the parameter value of each desire of the instinct model, comprising:

emotional behavior and/or desire updating means for sequentially updating the parameter value of each emotional behavior and/or the parameter value of each desire, depending on corresponding sensitivity individually set to each emotional behavior and/or each desire, on the basis of externally applied stimulation and/or the lapse of time; and

sensitivity updating means for evaluating an environment and respectively updating the sensitivity corresponding to each

emotional behavior and/or each desire on the basis of the evaluated result.

20. The robot apparatus according to claim 19, wherein said sensitivity changing means evaluates the environment on the basis of the parameter value of each emotional behavior and/or the parameter value of each desire which are sequentially updated.

21. The robot apparatus according to claim 19, wherein said emotion models include six emotional behaviors of joy, sadness, anger, surprise, disgust and fear as said emotional behaviors.

22. The robot apparatus according to claim 19, wherein said instinct models include four desires of exercise, affection, appetite and curiosity as said desires.

23. A control method for a robot apparatus having emotion models consisting of a plurality of emotional behaviors and instinct models consisting of a plurality of desires, for generating action on the basis of the parameter value of each emotional behavior of the emotion model and/or the parameter value of each desire of the instinct model which are sequentially updated in accordance with prescribed conditions, comprising:

a first step of restricting the number of the emotional behaviors and/or the desires used for generating the action; and a second step of increasing or decreasing stepwise the number of the emotional behaviors and/or the desires used for generating the action.

24. The control method for a robot apparatus according to claim
23, wherein

in the second step, the number of the emotional behaviors or the desires used for generating the action is increased stepwise on the basis of the accumulation of prescribed stimulation which are externally applied and/or the lapse of time.

25. The control method for a robot apparatus according to claim
23, wherein:

said robot apparatus generates the action on the basis of each of the parameter values of the emotional behaviors and/or the desires and a prescribed behavioral model, and changes the behavioral model in the action generating means, to a behavioral model whose growth level is higher than that of the former, on the basis of the accumulation of prescribed stimulation which are externally applied and/or the lapse of time; and

in the second step, the number of the emotional behaviors and/or the desires employed for generating the action is increased

or decreased depending on the change of the behavioral model by the behavioral model changing means.

26. The control method for a robot apparatus according to claim 23, wherein

 said emotion models include six emotional behaviors of joy, sadness, anger, surprise, disgust and fear as said emotional behaviors.

27. The control method for a robot apparatus according to claim 23, wherein

 said instinct models include four desires of exercise, affection, appetite and curiosity as said desires.

28. The control method for a robot apparatus according to claim 23, wherein:

 the second step comprises, for each stage, an updating step of sequentially updating the parameter value of each emotional behavior and/or the parameter value of each desire, depending on corresponding sensitivity individually set to each emotional behavior and/or each desire, on the basis of the stimulation and/or the lapse of time; and

 a sensitivity updating step of evaluating an environment and respectively updating the sensitivity corresponding to each

emotional behavior and/or each desire on the basis of the evaluated result.

29. A control method for a robot apparatus having emotion models consisting of a plurality of emotional behaviors and instinct models consisting of a plurality of desires, for generating action on the basis of the parameter value of each emotional behavior of the emotion model and/or the parameter value of each desire of the instinct model, comprising:

a first step of updating the parameter value of each emotional behavior and/or the parameter value of each desire, depending on corresponding sensitivity individually set to each emotional behavior and/or each desire, on the basis of externally applied stimulation and/or the lapse of time; and

a second step of evaluating an environment and respectively updating the sensitivity corresponding to each emotional behavior and/or each desire on the basis of the evaluated result.

30. The control method for a robot apparatus according to claim 29, wherein

in the second step, the environment is evaluated on the basis of the parameter value of each emotional behavior and/or the parameter value of each desire which are sequentially updated.

31. The control method for a robot apparatus according to claim 29, wherein

 said emotion models include six emotional behaviors of joy, sadness, anger, surprise, disgust and fear as said emotional behaviors.

32. The control method for a robot apparatus according to claim 29, wherein

 said instinct models include four desires of exercise, affection, appetite and curiosity as said desires.

33. A robot apparatus, comprising:

 detecting means for detecting an output from another robot apparatus; and

 character discriminating means for discriminating a character of said another robot apparatus on the basis of a result detected by said detecting means.

34. The robot apparatus according to claim 33, comprising

 character changing means for changing own character on the basis of the result detected by said character discriminating means.

35. The robot apparatus according to claim 33, wherein:

 said detecting means comprises:

an action detecting section for detecting an action of
said another robot apparatus; and

emotion recognizing means for recognizing an emotion of
said another robot apparatus on the basis of a result
detected by said action detecting means; and wherein
said character discriminating means discriminates a character
of said another robot apparatus on the basis of said emotion
recognized by said emotion recognizing means.

36. The robot apparatus according to claim 35, wherein
said character discriminating means discriminates a character
of said another robot apparatus on the basis of said emotion
within a definite time, which is recognized by said emotion
recognizing means.

37. The robot apparatus according to claim 38, wherein:
said detecting means detects emotion data or character data
from said another robot apparatus; and
said character discriminating means discriminates a character
of said another robot apparatus on the basis of said emotion data
or character data.

38. The robot apparatus according to claim 34, wherein

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said character changing means changes a parameter of a character model which determines own character, on the basis of a result discriminated by said character discriminating means.

39. The robot apparatus according to claim 33, comprising action control means for moving the robot apparatus as a whole and component members, on the basis of action information, and wherein

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said character changing means changes said action information on the basis of a result discriminated by said character discriminating means.

40. The robot apparatus according to claim 35, comprising memory means for storing action patterns deriving from an emotion of another robot apparatus, and wherein
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said emotion recognizing means recognizes an emotion by comparing an action of said another robot apparatus with said action pattern.

41. The robot apparatus according to claim 33, comprising dialogue detecting means for detecting a dialogue between another robot apparatus and a user, and wherein
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said character discriminating means discriminates a character of said another robot apparatus by referring to a result detected by said dialogue detecting means.

42. A character discriminating method for robot apparatus, wherein

an output from a robot apparatus is detected to discriminate a character of said robot apparatus on the basis of a detected result.

43. The character discriminating method for robot apparatus according to claim 42, wherein

a character discriminating result is used for changing a character of another robot apparatus.

44. The character discriminating method for robot apparatus according to claim 43, wherein

an emotion is recognized from an action of said robot apparatus which is an output from said robot apparatus, to discriminate a character of said robot apparatus on the basis of a recognition result of the emotion.

45. The character discriminating method for robot apparatus according to claim 44, wherein

the character of said robot apparatus is discriminated on the basis of a recognition result of said emotion within a definite time.

46. The character discriminating method for robot apparatus according to claim 42, wherein

emotion data or character data from said robot apparatus which is an output from said robot apparatus is detected, to discriminate a character of said robot apparatus on the basis of said emotion data or character data.

47. The character discriminating method for robot apparatus according to claim 44, wherein

another robot apparatus which stores action patterns deriving from an emotion of said robot apparatus recognizes an emotion by comparing an action of said robot apparatus with said action pattern.